IN THE TITLE:

Please amend the title of the application to appear as follows:

PROCESS OF MACHINING INNER OR OUTER JOINT PARTS ~~OR INNER JOINT PARTS~~ WITH PARALLEL PAIRS OF TRACKS ~~EXTENDING PARALLEL RELATIVE TO ONE ANOTHER, WHEREIN SAID PAIRS OF TRACKS ARE MACHINED SIMULTANEOUSLY~~

IN THE SPECIFICATION:

On page 9 of the English language translation of the specification, please amend the first heading of the specification to appear as follows:

~~Description~~ Technical Field

On page 9 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

The invention relates to a process of machining, in a chip forming way, outer joint parts and inner joint parts of constant velocity universal ball joints which comprise a longitudinal axis and an even number of ball tracks, wherein the ball tracks are arranged in pairs around the circumference, with the track ~~centre~~ center lines of the pairs of ball tracks being positioned in planes extending parallel relative to one another. Furthermore, the invention relates to devices for carrying out such processes.

On page 9 of the English language translation of the specification, please add a heading between the first and second full paragraphs of the specification to appear as follows:

Background

On page 10 of the English language translation of the specification, please add a heading between the first and second full paragraphs to appear as follows:

Summary Of The Invention

On page 10 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

It is ~~the~~ an object of the present invention to ~~propose~~ provide improved production processes for machining the ball tracks of the initially mentioned joint parts (outer joint part, inner joint part) of TBJ joints and to define suitable devices for carrying out such machining processes.

On page 10 of the English language translation of the specification, please amend the third full paragraph to appear as follows:

A first solution ~~consists in~~ is a process for machining in a chip forming way outer joint parts and inner joint parts of constant velocity universal ball joints which comprise a longitudinal axis Aa, Ai and a number of ball tracks, wherein the balls tracks are circumferentially arranged in pairs whose track ~~centre~~ center lines are positioned in planes E_1, E_2, E_3, E_4 extending parallel relative to one another, wherein the pairs of tracks each are machined by rotating disc tools whose axes of rotation R intersect the respective longitudinal axis Aa, Ai perpendicularly at a distance from one another and are held and guided coaxially relative to one another. It ~~must~~ should be ~~possible to appreciate~~ appreciated that the process referred to here is able to reduce the machining times as compared to previous processes wherein each ball track had to be machined individually, because the number of re-clamping operations as well as the number of machining processes is halved.

On page 11 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

According to a particularly advantageous embodiment ~~it is proposed that~~, during the chip-forming machining operation, the outer joint parts and inner joint parts respectively are guided linearly in the direction of their respective longitudinal axis Aa, Ai and that the axes of rotation of the disc tools 16, 26 during the chip-forming machining operation are guided synchronously in a linear or pivoting movement radially relative to the respective longitudinal axis Aa, Ai. In this way, the movement sequences are considerably simplified, so that, at a later stage, simply designed devices for carrying out the process can be provided.

On page 11 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

Furthermore, ~~it is proposed that~~ at least two pairs of ball tracks – more particularly radially opposed pairs of ball tracks – ~~are~~ can be machined simultaneously. The number of re-clamping operations and the number of machining operations can again be reduced. The process referred to here applies to joint part of joints with four, six or eight pairs of tracks.

On page 11 of the English language translation of the specification, please amend the third full paragraph to appear as follows:

Equally, ~~it is proposed~~ the method provides – with reference to a simplified design of the devices to be used - that the disc tools are driven in pairs at identical speeds.

On page 11 and continuing on page 12 of the English language translation of the specification, please amend the fourth full paragraph to appear as follows:

A second solution ~~consists in providing~~ provides a process for machining in a chip forming way outer joint parts and inner joint parts of constant velocity universal ball joints which comprise a longitudinal axis Aa, Ai and a number of ball tracks, wherein the balls tracks are circumferentially arranged in pairs whose track ~~centre~~ center lines are positioned in planes E_1, E_2, E_3, E_4 extending parallel relative to one another, wherein the pairs of ball tracks are machined by rotating finger tools whose axes of rotation R intersect the respective longitudinal axis Aa, Ai in pairs symmetrically relative to one another at a distance from one another and whose axes of rotation R are held and guided in pairs and parallel relative to one another.

On page 12 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

A third solution deviating insubstantially from the second solution ~~consists in providing~~ provides a process for machining in a chip forming way outer joint parts and inner joint parts of constant velocity universal ball joints which comprise a longitudinal axis Aa, Ai and a number of ball tracks, wherein the balls tracks are circumferentially arranged in pairs whose track ~~centre~~ center lines are positioned in planes E_1, E_2, E_3, E_4 extending parallel relative to one another, wherein the pairs of ball tracks are machined by rotating finger tools whose axes of rotation R intersect the respective longitudinal axis Aa, Ai in pairs symmetrically relative to one another at a distance from one another and whose axes of rotation R are arranged and guided in pairs at a constant angle relative to one another. Both with the disc tools and with the finger tools, the track cross-section is defined by the tool profile in a section through the axis of rotation. Whereas the axis of rotation of the disc tools is aligned at a distance from and transversely to the longitudinal track extension, the axis of rotation of finger tools is aligned substantially perpendicularly relative to the track base. With disc tools, both track flanks are thus machined in the same cutting direction, whereas with finger tools, the two track flanks are machined in opposed cutting directions.

On page 12 and continuing on page 13 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

Analogously to the process mentioned first, ~~it is also proposed~~ with the further processes using finger tools ~~that~~, during the chip-forming machining operation, the outer joint parts and inner joint parts ~~are~~ can be guided linearly in the direction of their respective longitudinal axis Aa, Ai and ~~that~~ the axes of rotation R of the finger tools, during the chip-forming machining operation, ~~are~~ can be guided synchronously and in movements with constant angles relative to one another in such a way that an axis of symmetry Rs positioned between the axes of rotation R is guided in a linear and/or pivoting movement radially relative to the respective longitudinal axis Aa, Ai. In this case, too, for the purpose of increasing production, ~~it is proposed that~~ at least two pairs of ball tracks – more particularly radially opposed pairs of ball tracks of an inner joint part – ~~are~~ can be machined simultaneously. With outer joint parts, machining at least two pairs can be difficult because of the available space.

On page 13 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

With reference to providing suitable devices, ~~it is proposed that~~ the rotating finger tools are driven in pairs at identical speeds. The directions of rotation can be identical or opposite to one another.

On page 13 and continuing on page 14 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

For carrying out the process mentioned first, there is ~~proposed~~ provided a device for machining in a chip-forming way the ball tracks of outer joint parts and inner joint parts, which device ~~is characterised in that it~~ comprises one clamping device for an outer joint part or an inner joint part as well as two disc tools whose axes of rotation R extend coaxially relative to one another and which intersect the respective longitudinal axis Aa, Ai of the outer joint part or inner joint part perpendicularly at a distance from one another. To simplify the movements, ~~it is proposed~~ according to a first embodiment ~~that~~ the clamping device comprises a feeding device for ensuring axial feeding in the direction of the respective longitudinal axis Aa, Ai, and ~~that~~ the driving device for the disc tools 16, 26 comprises only a feeding device for feeding the disc tools radially relative to the respective longitudinal axis Aa, Ai. Alternatively, ~~it is proposed that~~ the clamping device comprises a feeding device for ensuring axial feeding in the direction of the respective longitudinal axis Aa, Ai, and ~~that~~ the driving device for the disc tools 16, 26 comprises only a pivoting device for pivoting the disc tools 16, 26 around a pivot axis intersecting the respective longitudinal axis Aa, Ai. In both cases, the ~~means~~

mechanisms for carrying out the movements can be reduced considerably and thus become more cost-effective. More particularly, for changing the machining operation from one pair of tracks to the next pair of tracks ~~it is proposed that~~ the clamping device for the outer joint part or inner joint part is associated with a rotary drive, whereas the tools, with reference to the longitudinal axis, are arranged circumferentially fixed.

On page 14 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

Furthermore, ~~it is proposed that~~ at least two disc tools comprise a common rotary drive. More particularly, ~~it is proposed that the~~ at least two disc tools are produced so as to be integral with one another.

On page 14 and continuing on page 15 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

For carrying out the above-mentioned process mentioned first, there is ~~proposed~~ provided a device for machining in a chip-forming way the ball tracks of outer joint parts and inner joint parts, which device ~~is characterised in that it~~ comprises one clamping device for an outer joint part or an inner joint part as well as at least two rotating finger tools whose axes of rotation R extend parallel relative to one another and intersect the respective longitudinal axis Aa, Ai in pairs symmetrically relative to one another at a distance from one another; or ~~which is characterised in that~~ it comprises a clamping device for an outer joint part or an inner joint part as well as at least two rotating finger tools whose axes of rotation R form a fixed angle relative to one another and intersect the respective longitudinal axis Aa, Ai in pairs symmetrically relative to one another at a distance from one another. Equally, for the purpose of simplifying and reducing the moving ~~means it is proposed~~ mechanism, as an alternative, ~~that~~ the clamping device comprises a feeding device to ensure axial feeding in the direction of the respective longitudinal axis Aa, Ai, and ~~that~~ the driving device for the finger tools comprises only a feeding device for feeding in the finger tools radially relative to the respective longitudinal axis Aa, Ai. ~~or that~~ Alternatively, the clamping device comprises a feeding device to ensure axial feeding in the direction of the respective longitudinal axis Aa, Ai, and ~~that~~ the driving device for the finger tools comprises only a pivoting device for pivoting the finger tools around a pivot axis intersecting the respective longitudinal axis Aa, Ai. A further simplification can be achieved if the at least two finger tools comprise a common rotary drive. Such a common rotary drive for the finger tools can comprise more particularly a driven spur gear or bevel gear which engages spur gears which are positioned on the tool axes and are firmly connected with the finger tools.

On page 15 of the English language translation of the specification, please add a heading before the first full paragraph to appear as follows:

Brief Description Of The Drawings

On page 15 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

Figure 1 shows a process for machining in a chip-forming way ball tracks in an outer joint part by ~~means of~~ disc tools:

~~a)~~ A) in a longitudinal section through the longitudinal axis of the outer joint part; and

~~b)~~ B) in a cross-section through the longitudinal axis of the outer joint part.

On page 15 and continuing on page 16 of the English language translation of the specification, please amend the third full paragraph to appear as follows:

Figure 2 shows a first embodiment of a process for machining in a chip-forming way ball tracks in an inner joint part by ~~means of~~ disc tools:

~~a)~~ A) in a longitudinal section through the longitudinal axis of the inner joint part; and

~~b)~~ B) in a cross-section through the longitudinal axis of the inner joint part.

On page 16 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

Figure 3 shows a process of machining in a chip-forming way ball tracks in an inner joint part in a cross-section through the longitudinal axis of the inner joint part by ~~means of~~ disc tools.

On page 16 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

Figure 4 shows a process of machining in a chip-forming way the ball tracks of an outer joint part by ~~means of~~ axis-parallel finger tools:

~~a)~~ A) in a first longitudinal section through the longitudinal axis of the outer joint part; and

~~b)~~ B) in a second longitudinal section through the longitudinal axis of the outer joint part, extending perpendicularly thereto.

On page 16 of the English language translation of the specification, please amend the third full paragraph to appear as follows:

Figure 5 shows a first embodiment of a process of machining in a chip-forming way the ball tracks of an outer joint part by ~~means of~~ finger tools enclosing an angle:

~~a)~~ A) in a first longitudinal section through the longitudinal axis of the outer joint part; and

~~b)~~ B) in a second longitudinal section through the longitudinal axis of the outer joint part, extending perpendicularly thereto.

On page 16 of the English language translation of the specification, please amend the fourth full paragraph to appear as follows:

Figure 6 shows a process of machining in a chip-forming way the tracks of an outer joint part by ~~means of~~ finger tools enclosing an angle, in an embodiment according to Figure 5:

~~a)~~ A) in a longitudinal section through the longitudinal axis of the outer joint part; and

~~b)~~ B) in an axial section through the longitudinal axis of the outer joint part.

On page 17 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

Figure 7 shows a second embodiment of a process of machining in a chip-forming way the ball tracks of an outer joint part by ~~means of~~ finger tools enclosing an angle:

~~a)~~ A) in a first longitudinal section through the longitudinal axis of the outer joint part; and

~~b)~~ B) in a second longitudinal section through the longitudinal axis of the outer joint part, extending perpendicularly thereto.

On page 17 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

Figure 8 shows a process of machining in a chip-forming way the ball tracks of an inner joint part by ~~means of~~ finger tools forming an angle, comprising a first embodiment of a device in a cross-section through the longitudinal axis of the inner joint part.

On page 17 of the English language translation of the specification, please amend the third full paragraph to appear as follows:

Figure 9 shows a process of machining in a chip-forming way the ball tracks of an inner joint part by ~~means of~~ finger tools enclosing an angle, comprising a second embodiment of a device in a cross-section through the longitudinal axis of the inner joint part.

On page 17 of the English language translation of the specification, please add a heading between the third and fourth full paragraphs to appear as follows:

Detailed Description

On page 17 and continuing on page 18 of the English language translation of the specification, please amend the fourth full paragraph to appear as follows:

Figure 1 whose illustrations will be described jointly below shows an outer joint part 11 which is provided for a so-called twin ball joint comprising circumferentially distributed ball tracks 12_1, 12_2 arranged in pairs around the circumference in such a way that their track ~~centre~~ center lines extend in parallel planes E_1,E_2,E_3,E_4 arranged in pairs. Furthermore, the outer joint part 11 is shown to comprise a joint base 13 and a joint aperture 14. Between the ball tracks 12_1, 12_2 there are provided guiding webs 15_1, 15_2 of different widths which form part of an inner spherical guiding face for a ball. Whereas the width of the guiding face 15_1 between a pair 12_1, 12_2 of ball tracks remains substantially constant in the longitudinal direction, the width of the guiding face 15_2 between different pairs of ball tracks changes in the longitudinal direction, which is known in itself. In contrast to standard joints wherein the individual ball tracks are positioned in radial planes, as a result of which the circumferential distance between the individual ball tracks constantly changes in the longitudinal direction, the circumferential distances between the tracks 12_1, 12_2 of the pairs of ball tracks 12_1, 12_2 of a joint of the type described here are constant in the longitudinal direction.

On page 18 and continuing on page 19 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

Because of the way in which the ball tracks extend, it is possible for them to be machined in the manner described here by pairs of rotating disc tools 16_1, 16_2 whose axes of rotation R_1,R_2 extend coaxially and, in this case, are held in a common holding device 17. The holding device 17 is only partially shown because, by necessity, it has to be connected to ~~driving means~~ a drive which ~~extend~~ extends through the joint aperture 14 into the outer joint part 11. The rotating drive of the disc tools 16_1, 16_2 can be effected by a belt drive for example. According to a preferred embodiment of the process, the outer joint part 11, during the mechanical production of a pair of tracks, is displaced only on the longitudinal axis Aa in the direction of the axis Z, while the holding device ~~14~~ 17 carries out an entirely transverse movement perpendicularly to the longitudinal axis Aa in the direction of axis X ~~characterised~~ characterized by a double arrow, so that the disc tools 16_1, 16_2 have to be displaced. After the chip-forming machining operation carried out on a pair of tracks has been completed, the holding device 17 can be displaced radially or the outer joint part can be displaced axially to such an extent that the disc tools leave the respective pair of tracks completely. Thereafter, the clamping device for the outer joint part 11 (not shown here) can be rotated by the pitch angle between the pairs of tracks 12_1, 12_2 , in the present case by 90°. This can be followed by a further pair of tracks being machined in a chip-forming way. Said operation is repeated, four times in the present case, until all pairs of tracks

12_1, 12_2 have been machined. In this case the machining operation can be milling or grinding.

On page 19 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

Figure 2 shows an inner joint part 21 of a joint whose parallel tracks are arranged in pairs (twin ball joint) being machined in a chip-forming way. The pairs of tracks are designed in such a way that their ~~centre~~ center lines extend in planes E_1, E_2,E_3,E_4 which extend parallel relative to one another. In this case, too, guiding webs 25_1 are arranged between the tracks of a pair and guiding webs 25_2 between the tracks of two adjoining pairs, which webs form part of an externally spherical face on which a ball cage of a mounted constant velocity ball joint can be guided. The inner joint part 21 comprises a central aperture 23 with inner shaft teeth 24 for inserting a driving journal. In a longitudinal section, groups of arrows 28, 29, 30 indicate the holding forces of a clamping device which engages the aperture 23. The machining operation can be a milling or grinding operation.

On page 19 and continuing on page 20 of the English language translation of the specification, please amend the second full paragraph to appear as follows:

The above-mentioned design of the pairs of tracks 22_1, 22_2 , in this case, too, makes it possible to carry out a chip-forming machining operation in the preferred way in which two pairs of rotating disc tools 26_1, 26_2 and 26_3, 26_4 engage radially opposed pairs of tracks 22_1, 22_2. With this type of machining process, the inner joint part 21 is fed forward entirely in the direction of the axis Z, whereas the holding devices 27_1, 27_2 for the rotating disc tools 26_1, 26_2 and 26_3, 26_4 which ~~comprise~~ comprises a corresponding driving ~~means~~ mechanism move entirely in the X-direction perpendicularly to the longitudinal axis Ai of the inner joint part 21. The axes of rotation R_1, R_2 as well as R_3, R_4 extend in pairs coaxially and perpendicularly, at a distance, relative to the longitudinal axis Ai of the inner joint part 21. After the machining operation on two radially opposed pairs of tracks, which is illustrated in the drawing, the rotating disc tools 26 have to be disengaged from the track; thereafter, the clamping device of the inner joint part 21 has to be rotated by the pitch angle between the individual pairs of tracks, in the present case once by 90° to be able to repeat the machining operation on the two further pairs of tracks in the same way. Thereafter, i.e. after only two machining operations have been carried out for the entire inner joint part 21, the process of machining the ball tracks 12 is completed. The individual machining operations can be milling or grinding.

On page 20 and continuing on page 21 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

In Figure 3, details identical to those in Figure 2 have been given the same reference numbers, and to that extent, reference is made to the description of same. The inventive process of machining pairs of ball tracks in a chip-forming way takes place simultaneously on all four existing pairs of tracks of the ball tracks 22_1, 22_2. For this purpose, the device used, in addition to the holding devices and driving devices 27_1, 27_2 for the pairs of rotating disc tools 26_1, 26_2 and 26_3, 26_4 comprises two further holing devices and driving devices 27_3, 27_4 with further pairs of rotating disc tools 26_5, 26_6 and 26_7, 26_8. The respective axes of rotation of said additional holding devices and driving ~~means~~ devices have been given the reference symbols R_5, R_6 and R_6, R_7. In a device of this type, the clamping device for the inner joint part 21 does not require the driving ~~means~~ mechanism for rotation. In this embodiment, the machining of all the ball tracks 22_1, 22_2 of the inner joint part 21 takes place in one single operating phase. During the machining of the pairs of tracks 22, the holding devices 27_1, 27_2 and 27_3, 27_4 are moved perpendicularly to the longitudinal axis Ai, which is indicated by the double arrows X_1, X_2 and X_3, X_4 , these operations taking place simultaneously with the forward feed of the inner joint part 11 on the longitudinal axis Ai.

On page 21 of the English language translation of the specification, please amend the first full paragraph to appear as follows:

Figure 4 shows an outer joint part according to Figure 1 while the machining operation takes place on the ball tracks 12 by ~~means~~ way of axis-parallel finger tools. Identical details of the outer joint part 11 have been given the same reference numbers as in Figure 1. Thus, reference is made to the description of same. For machining one pair of ball tracks 12_1, 12_2 there is provided a pair of rotating finger tools 36_1, 36_2 which are received in a common holding device and driving device 37 and whose axes of rotation R_{11}, R_{12} are arranged parallel relative to one another. To allow a movement along the entire track extension of the pairs of tracks through the aperture 14 of the inner joint part 11, the axis of symmetry Rs between the axes 36_1, 36_2 forms an acute angle with the longitudinal axis Aa of the outer joint part 11. The forward feed of the clamping device for the outer joint part 11 is ~~symbolised~~ symbolized by the double arrow Z. A double arrow X extending perpendicularly relative to the longitudinal axis Aa indicates the simultaneous forward movement of the holding device 37. Instead of the latter forward movement or in addition thereto, there can be provided a pivot drive for the holding device 37 by ~~means of~~ which it is possible to continuously change the angle between the axis of symmetry Rs and the longitudinal axis Aa according to ~~illustration *b*~~ Figure

4B. When machining the pair of tracks in the way illustrated here, the pair of finger tools 36_1, 36_2 has to be disengaged from the corresponding pair of tracks 12_1, 12_2, and the clamping device for the outer joint part 11 or the holding device and driving device 37 of the finger tools 36_1, 36_2 has to be rotated by the pitch angle of the pairs of tracks, i.e. by 90°, around the longitudinal axis Aa. Preference is given to the rotation of the clamping device of the outer joint part 11.